

# ENERGY \$AVER\$

"... For Business and Industry"

VOLUME 1 / NUMBER 3

## ELECTRICAL RATE STRUCTURE KNOWLEDGE CAN SAVE ENERGY DOLLARS

CANADIANA

MAY 14 1990

### The Facts ...

Have you ever wondered how your electrical costs are calculated by your utility company or how the rate structure on which you are billed results in your monthly charge? Finding the answer to these questions can be the first step toward reducing your electrical utility costs.

To develop a plan for using electricity more efficiently, it is essential that consumers understand how different types of rate structures interact with their use of electricity. Significant cost savings can be achieved by making knowledgeable decisions.

In Alberta, electrical utilities are both privately and publicly owned. These organizations are granted a monopoly, the exclusive right to provide service, in a designated area. However, they are limited by regulatory agencies (like the Public Utilities Board) as to the amount of profit they can make based on their investment in property and equipment.

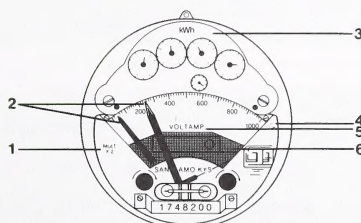
Electrical utilities set rate structures to cover their costs which are submitted to government agencies for review and approval. Rate structures vary because each utility has different costs associated with providing electrical service to its customers.

To monitor a customer's electrical energy use, the utility installs a meter. For industries and commercial oper-

ations that use large amounts of electricity, the meter is usually a thermal-demand type. This type of meter measures both consumption (kilowatt hours) and demand (kilowatts or kilovolt amperes).

Consumption (energy) is the total amount of electrical energy used during a defined period, normally one month. Demand is the maximum amount of electrical power used at any single time during the period. A consumer's monthly bill is based on both the demand and the consumption readings. The cost for the electrical service is determined by applying utility rate structures to the meter readings.

### THERMAL-DEMAND TYPE METER



1. Internal meter multiplier
2. Demand pointers
3. Consumption dials (kW.h)
4. Kh factor
5. Type of meter (watts or volt-amps)
6. Rotating disk

Some rate structures are demand-charge based while others are con-

sumption-charge (energy) based. The difference between the demand- and consumption-based structures is that one is more cost sensitive to a change in billed demand and less sensitive to a change in consumption (energy), and vice versa.

In Alberta, consumption-related rate structures frequently have one or more blocks of consumption which are demand-related, that is, the size of the demand determines the size of the consumption block.

The two privately owned electrical utility companies in Alberta have demand-oriented rate structures. For consumers served by these utilities, demand costs represent a significant percentage of their total electrical costs. Under this type of rate structure, the greatest potential for dollar savings is demand-related.

The cities of Edmonton and Calgary, and some other Alberta municipalities, operate electrical utilities. Many of these utilities have energy-oriented (consumption) rate structures that have demand-related blocks. Under these rate structures both the demand and the consumption blocks affect the potential for saving. However, because these rate structures are consumption oriented, the greatest potential for savings is associated with reduced consumption.

It is important that the consumer understand what impact his electrical load has on the rate structure. De-



pending on their interaction, the potential for dollar savings may vary. Two identical facilities, operated the same, will have different electrical costs depending on the billing structure.

To reduce electrical costs through energy management, different practices will be effective under different rate structures. When considering changes to an electrical system, users should first determine the implications of the proposed modification based on the type of metering used and the rate structure involved.

**Load scheduling** — controlling the loads being switched on at any particular time to reduce the peak demand — is one modification to consider.

This practice will be more cost effective for facilities where monthly electrical charges are primarily due to demand. The cost savings through load scheduling for facilities based on an energy-oriented rate structure are generally not as significant, making this a less attractive energy management plan. Conversely, reducing operating periods by shutting off equipment when it is not required will be more cost effective for customers billed on energy-oriented rate structures than for those on demand-oriented rate structures.

To determine which option will be the most cost effective, an awareness of your electrical rate structure and how it interacts with your electrical meter readings is essential. Taking the time to look closely at your particular rate structure can pay off in big dollar savings.

## The Application ...

To develop an energy management plan for your facility, you should first understand how your electrical load interacts with the rate structure on which you are billed. Depending on how the two interact, the potential for dollar savings may vary.

To compare the effect of different rate structures, an example consumer's

electrical costs will be calculated for each type of rate structure. The example consumer will be a multi-storey, multi-use facility (similar to a YMCA/YWCA residential/recreational building of 100 000 to 150 000 square feet (9290 to 13 940 square metres) with 24-hour accommodation and 16-hour recreational use).

The monthly electrical meter reading for a facility of this type and size could be 270 kV.A (kilovolt amperes) demand and 144 000 kW.h. (kilowatt hours) monthly consumption. To determine a total monthly cost, a typical demand-oriented rate structure and a typical energy-oriented (consumption) rate structure will be applied to the facility's demand and consumption readings.

A comparison of the facility's relative demand and consumption cost, as calculated on the two rate structures, illustrates the different focus of each rate structure. For the demand-oriented rate, 64 per cent (\$4155.30/\$6499.62) of the monthly cost is associated with the metered demand, while for the energy-oriented rate, only 46 per cent [(\$2227.50 + \$1647.00)/\$8405.00] is associated with the demand.

In this example, the energy-oriented rate structure resulted in a higher total bill (\$8405.00 compared with \$6499.62). Under different consumer electrical use conditions (different demand and energy readings), the total monthly bill might have been

### Demand-Oriented Rate Structure

**Demand**  $270 \text{ kV.A} \times 0.9 = 243 \text{ kW}$

(Billing demand may be metered by a kW - or a kV.A-type meter. If it is measured in kV.A, but the utility company rate structure is based on kW, the reading may be converted to kW by multiplying the kV.A reading by a factor such as 0.9).

**Consumption** 144 000 kW.h

#### Demand Cost

•  $243 \text{ kW at } \$17.10/\text{kW per month} = \$4155.30$

#### Consumption Cost

•  $400 \times 243 \text{ kW} = 97\,200 \text{ at } \$0.0181/\text{kW.h} = 1759.32$   
(for first 400 kW.h/kW of billed demand per month)

•  $144\,000 - 97\,200 = 46\,800 \text{ kW.h at } \$0.0125 = 585.00$   
(for energy in excess of 400 kW.h/kW of billed demand per month)

**Total Cost** = **\$6499.62**

### Energy-Oriented Rate Structure (with demand-related blocks)

**Consumption Cost (fixed)** first 6200 kW.h = \$ 550.00

#### Demand-Related Energy Cost

$100 \times 270 \text{ kV.A} = 27\,000 \text{ at } \$0.0825 = 2227.50$   
(Rate structure demand based on kV.A)

$100 \times 270 \text{ kV.A} = 27\,000 \text{ at } \$0.0610 = 1647.00$

#### Consumption Cost (for remaining energy)

$144\,000 - (6200 + (2 \times 27\,000)) = 3980.50$   
 $83\,800 \text{ kW.h at } \$0.0475/\text{kW.h}$

**Total Cost** = **\$8405.00**



higher on the demand-oriented rate structure.

The impact that electrical demand, energy consumption and rate structure have on the consumer's monthly bill shows the importance of under-

standing electrical billing. To become familiar with your rate structure, or to address specific questions, contact your local utility representative. If additional assistance is desired, relative to your utility costs and energy

use, Alberta Department of Energy, Energy Conservation Branch, provides information and assistance to owners and managers of industrial, commercial and institutional facilities.

## SECTOR REVIEW

### Electrical Energy Use in Alberta

Energy use varies widely depending on the type of building and the activities in that building. The variety of energy use has become evident following Energy Bus audits of almost every type of building in Alberta.

An energy audit determines initially how energy is being used and how much it costs in each area of use. Energy conservation measures are then identified which should result in energy cost savings. On average, the Energy Bus has identified a potential reduction in energy costs of about 20 per cent.

According to Alberta's Energy Bus audit program database, the total energy cost incurred yearly by 1295 audited facilities was \$113 million, with \$65 million being spent on electrical energy. As shown in Figure 1, this represents 57 per cent of the average energy consumer's utility dollars. However, because a unit of electricity costs four to five times more than an equivalent unit of natural gas, the electricity purchased represents only 22 per cent of the total energy used by the audited facilities.

Figure 2 shows total energy requirements in the form of energy indices (kilowatt hours per square foot per year) for 10 energy-using sectors. The energy indices are broken down into electrical, natural gas and others.

An analysis of electrical energy use and costs in each sector is shown in Figure 3. As would be expected, the

FIGURE 1

#### ELECTRICAL USE IN ALBERTA

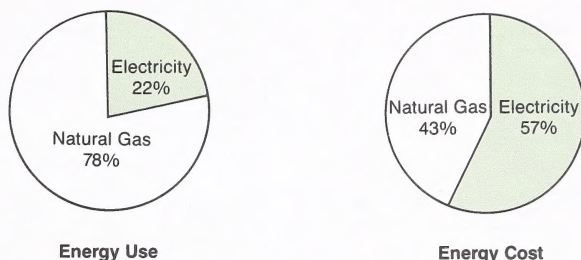


FIGURE 2

#### ENERGY USE BY SECTOR

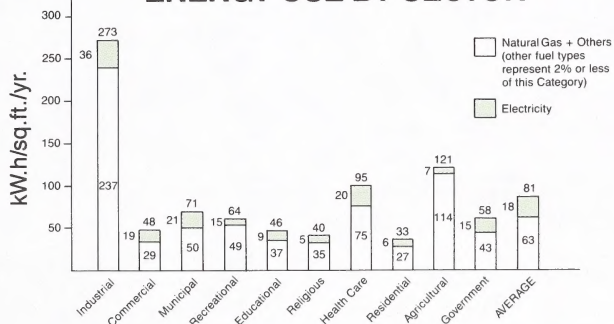
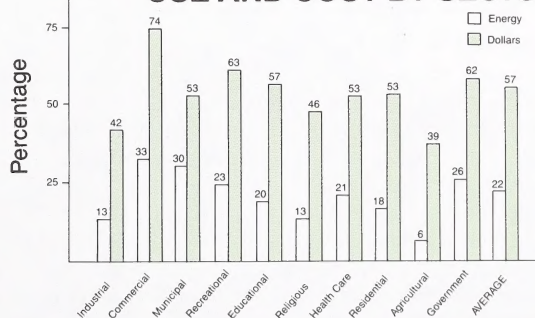


FIGURE 3

#### PER CENT OF ELECTRICAL ENERGY USE AND COST BY SECTOR





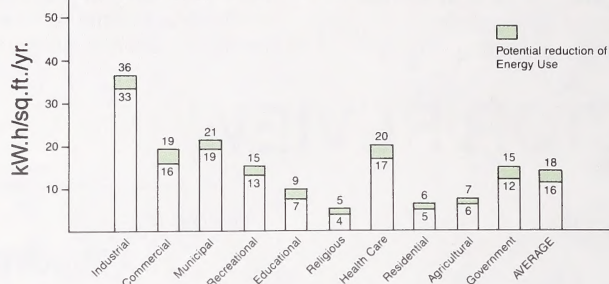
actual energy use varies from sector to sector, depending on the type of rate structure under which the facility is billed (demand-oriented or energy-oriented) and the way in which the facility operates. Facilities which operate equipment for lengthy periods would tend to benefit from a demand-oriented rate structure. Conversely, facilities which operate equipment for short periods would tend to benefit from an energy-oriented rate structure.

Figure 4 identifies electrical energy use and the associated potential reductions identified by the Energy Bus audits. Figure 5 compares the potential saving of electrical energy relative to the potential saving of electrical costs for each sector.

As Figures 4 and 5 indicate, energy audits have identified good potential for saving electrical energy and associated demand and consumption costs in all sectors. The average energy saving identified was 12.2 per cent, while the average dollar saving was 15.9 per cent.

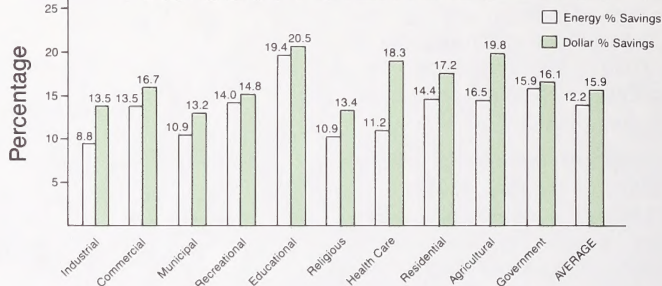
**FIGURE 4**

### ELECTRICAL ENERGY USE BY SECTOR



**FIGURE 5**

### PER CENT OF ELECTRICAL ENERGY AND COST POTENTIAL SAVINGS



## FOR MORE INFORMATION

The article *Electrical Rate Structure Knowledge Can Save Energy Dollars* was researched by Les Sladen, who also completed the Sector Review. For more detailed information on energy cost saving calculations and the energy audit database, contact the industrial section of the Energy Conservation Branch: Phone 427-5200 (collect).



# ENERGY \$SAVERS\$

**Energy Saver\$** is a series of fact sheets about energy conservation measures that have wide application in Alberta. Each issue highlights a different technology and its successful use in the province. The Sector Review summarizes energy use patterns of different facilities that have used Alberta's Energy Bus audit service. Comments, questions, and suggestions are welcome.

Write or phone (collect) to be placed on the mailing list. You may also obtain Energy Saver\$ back issues or arrange for an Energy Bus audit (conducted at no charge).

Energy Conservation Branch  
Alberta Department of Energy  
2nd Floor, 10010 - 106 Street  
Edmonton, Alberta, T5J 3L8  
Phone 427-5200

Pub. No. I/249 1989  
ISBN 0-86499-5660

**Alberta**  
ENERGY  
Energy Conservation Branch